

Grade 11 - Informational

Refrigerators, Then and Now

The first refrigerators were huge and expensive. They were also dangerous because their **refrigerant** was a poisonous gas. In the late 1800s, refrigerators were used only by businesses such as meatpacking plants and dairies. Decades later, when smaller models were made for home use, they still contained the same refrigerants. Because leaking gas could be harmful, most people weren't willing to risk owning a refrigerator. Sometimes, they were kept in backyards instead of inside homes.

Manufacturers worked to find a better refrigerant, and Freon was developed. Since Freon was nontoxic and wouldn't catch fire, it was no longer risky to own a refrigerator. Freon was used for about forty years before scientists discovered it might harm the environment. Appliances made today use refrigerants that are thought to be safe for both humans and the environment.

How Did People Get the Idea for Refrigerators?

The idea for artificial cooling was suggested by an observation. Someone—we don't know who—noticed that the contents of a container placed in brine would stay cold. (That's because heat is *absorbed*, or "soaked up," when the brine evaporates.) This showed that cooling did not need to depend on the use of ice.

Early in the 1800s, scientists and inventors began trying to create a refrigeration system. Two things were important to their work. One was knowing that heat moves naturally from some place warm to some place cooler. The other was understanding the way gases and liquids react to pressure. After years of experiments, scientists developed the cooling method that is still used today.

How Refrigerators Work

Circulating a refrigerant through the appliance cools refrigerators. When the refrigerant passes through the heat exchange coils, its temperature changes. Icy-cold refrigerant in coils inside the refrigerator absorbs "warmth" from the food storage area. The refrigerant cools again as it passes through coils outside the refrigerator—either on the back or underneath it. (That's why you might feel warm air coming from behind or below your refrigerator. Heat is moving from those outside coils into the cooler air of the kitchen.) Heat really is "exchanged" as it moves into and out of the coils.

Besides the two heat-exchange coils, the refrigerator has a **compressor** that puts pressure on the gas used as a refrigerant. This changes it into a liquid and pumps it into the outside coils. There's also an expansion valve that reduces the pressure on the refrigerant. This makes it expand and become even colder on its way to the coils inside. A fan blowing on these

coils speeds up the cooling and lowers the temperature in the freezer. (The humming sound you hear sometimes is the electric motor that runs the compressor and fan.) The refrigerant circulates in an endless cycle, absorbing the heat inside the refrigerator and releasing it into the room.

Thanks to experiments done in the 1800s and improvements made in the 1900s, we can prevent fresh foods and leftovers from spoiling. We can enjoy foods that were grown and frozen far away and kept frozen as they were brought to our grocery stores. We can have ice cubes anytime we want them. And our refrigerators are safe for the environment.